toxin present," Ramsdell says. Thus far, he adds, the luminescent system has detected as few as 10–100 toxic cells within a milliliter of water. Previous research has shown that levels between 350 and 6,900 cells per milliliter can kill fish, he notes.

Ramsdell and colleagues are preparing three different detection assays for use in the laboratory, in the field, and in clinics as a blood-analysis system. The methodology "works well in blood," he says, and will therefore let scientists confirm exposure in people. A boat-side assay, a rapid field test that would indicate the presence of the toxins in the water, will be based on two different reporter genes, and won't be ready for another year, he says.

Rublee predicts that his molecular probes for detecting the *Pfiesteria* organism—rather than its toxins—might be used in field tests by this fall. "The basis of our approach," Rublee explains, "is to look at the organism's DNA and to define within the DNA some targets unique to *Pfiesteria*, to produce a probe." Researchers in Rublee's lab may, for instance, simply use a section of the organism's genetic code as a 'primer,' which can amplify a piece of *Pfiesteria* DNA in a polymerase chain reaction. If amplification occurs, Rublee noted, "then we know *Pfiesteria* is there."

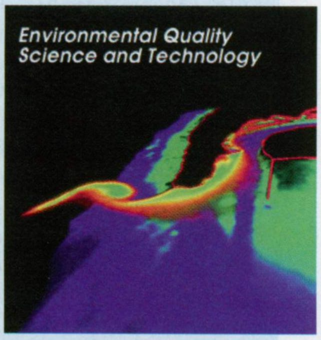
A spin-off technology links a fluorescent molecule to primer sections of genetic code. Researchers then expose targeted cells to a dye, and subject the sample to a washing cycle. "The idea is that *Pfiesteria* cells—the target—will bind the probe and the dye," Rublee says. "*Pfiesteria* cells will glow or fluoresce with that dye, and other cells will not."

Already, the Maryland Department of Natural Resources has offered to assist Ramsdell and Rublee with field-testing the new technologies. "We would love more than anything for them to bring [the techniques] here and go wild," departmental spokesperson John Surrick says. Like other states within the U.S. eastern coastal region, Maryland is evaluating more intensive water-monitoring plans, as well as pollution-reduction efforts, Surrick notes. For 1998, he says, the department will monitor an additional five river/creek systems, and more if necessary. And the Maryland Department of Health and Mental Hygiene will team up with the Centers for Disease Control and Prevention (CDC) and other states to examine the experiences of people exposed repeatedly to high-risk waters. On March 18, the CDC granted Maryland more than $1 million for research on *Pfiesteria*. The grant will be used to monitor people who frequent the state's rivers for symptoms associated with

EHPnet

Sediment Science

Marine environments are the homes of intricate aquatic ecosystems that can be severely impacted by contaminants. Hazardous waste sites, nonpoint source pollution, industrial and sewage discharges, ship discharges and activities, and the resuspension of contaminated sediments are all potential threats to these environments.



The U.S. Navy, which has ships and facilities in almost every coastal state, recognizes that these ecosystems are important environmental, economic, and aesthetic resources. Using state-of-the-art technology, the Navy is working to protect the environmental health of these ecosystems in the areas where it conducts operations. The division dedicated to this goal is the Environmental Quality Science and Technology Division within the Naval Command, Control, and Ocean Surveillance Center Research, Development, Test, and Evaluation Division (NRaD).

Information about some of the NRaD's efforts can be found on the home page for the Environmental Quality Science and Technology Division, located at **http://denix.cecer.army.mil/denix/Public/News/Navy/Outreach/Quality/quality.html #contents**. This page gives an overview of the division, which works with industry, academia, and government agencies in researching environmental technology to assess environmental quality, develop sensors, and carry out remediation. The table of contents contains links to several research programs within the division. The links give details about each program and contain pictures of program activities, as well as graphics depicting how some of the technologies work.

The link to Ecological Risk Assessment and Restoration describes efforts to identify and lessen the impacts resulting from Navy operations. The division has worked since 1980 to conduct ecological risk assessment, and has used the knowledge gathered from these assessments to carry out cleanup of several sites, evaluate solid waste and effluent discharges from Navy ships, and develop an approach to shipyard water compliance issues. The link describes one particular model called EcoRisk that the division has used to propose environmental standards for fleet operations. EcoRisk involves diverse tools such as three-dimensional models, measurement platforms, and biomarkers. The link contains a diagram of one such biomarker, the comet DNA strand break assay.

The link to Sediment Assessment and Remediation Technology Development provides information about the Navy's efforts to utilize technology to clean up contamination. Because remediation is affected by multidisciplinary problems, researchers with varying scientific backgrounds are working together to evaluate existing technologies and develop new ones. Current research focuses on bioremediation and particle separation technology, sediment assessment prediction and monitoring techniques, cost-effective sediment treatment trains, sediment contaminant biogeochemistry, rapid sediment profiling, and benthic contaminant flux sampling and measurement.

The NRaD is also working on technology that monitors the composition and toxicity of materials released by Navy ship and shore operations into the environment. The link to Environmental Sensor/Instrument Development provides information about analytical systems that identify and provide three-dimensional mapping of contaminants at sites before remediation and after cleanup. The link describes other sensor and instrument technology that the NRaD has developed or is developing, such as a laser-induced fluorescence sensor that uses fiber optics to detect petroleum-based products in the marine environment. This instrument is now used as the major sensor in a system that detects petroleum products in soils and groundwaters up to depths of 150 feet, providing accurate three-dimensional characterization of the subsurface contamination. This and other sensor systems developed by the NRaD are now being commercialized by private industry.